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(21) International Application Number: PCT/GB98/01586 (22) International Filing Date: 29 May 1998 (29.05.98) (30) Priority Data: 9712815.1 19 June 1997 (19.06.97) GB (71) Applicant (for all designated States except US): BRITISH AMERICAN TOBACCO INVESTMENTS LIMITED [GB/GB]; Millbank, Knowle Green, Staines, Middlesex TW18 1DY (GB). (72) Inventors; and (75) Inventors/Applicants (for US only): BIGGS, Philip, John [GB/GB]; 66 Laburnum Crescent, Hythe, Southampton SO45 3PN (GB). GILBERT, Richard, Thomas [GB/GB]; Brendan Court 3.32, The University of Bath, Bath, Avon BA2 7AY (GB). MCADAM, Kevin, Gerard [GB/GB]; 68 Angelica Way, Whiteley, Fareham PO15 7HZ (GB). NATARAJAN, Bhasker [IN/US]; 560 Kensington Road #5, Lancaster, PA 17603 (US). (74) Agents: MACLEAN, Kenneth, John, Hamson et al.; British American Tobacco Limited, R & D Centre, Patents Dept., Regents Park Road, Southampton SO15 8TL (GB).		(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, GW, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i> <i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>
(54) Title: SMOKING ARTICLE AND SMOKING MATERIAL THEREFOR (57) Abstract <p>The invention relates to a reconstituted smoking material which comprises a non-polyol aerosol generator, tobacco (optional), binder (optional) and inorganic filler. A further polyol aerosol generator may also be contained in the smoking material. There is also provided a smoking article containing such material in a conventional arrangement or with a core axially disposed within an annulus. A further aspect of the invention is the provision of a polyol or non-polyol aerosol generated disposed in the filter element of a smoking article, which may contain the inventive smoking material. The aerosol material on the filter is eluted into the aerosol of the smoke on burning of the smoking article.</p>		

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(54) Title: SMOKING ARTICLE AND SMOKING MATERIAL THEREFOR (57) Abstract The invention relates to a reconstituted smoking material which comprises a non-polyol aerosol generator, tobacco (optional), binder (optional) and inorganic filler. A further polyol aerosol generator may also be contained in the smoking material. There is also provided a smoking article containing such material in a conventional arrangement or with a core axially disposed within an annulus. A further aspect of the invention is the provision of a polyol or non-polyol aerosol generated disposed in the filter element of a smoking article, which may contain the inventive smoking material. The aerosol material on the filter is eluted into the aerosol of the smoke on burning of the smoking article.		

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Smoking Article and Smoking Material therefor

The subject invention relates to smoking articles, cigarettes for example, and smoking material therefor.

The patents literature contains many proposals for smoking materials for use in place of conventional cut tobacco cigarette filler.

It is an object of the subject invention to provide new smoking materials which provide for mainstream smoke which although containing low levels of tobacco derived components, is fully acceptable to the consumer.

The subject invention provides a smoking material comprising a non-polyol aerosol generator, up to 20% by weight tobacco, binder at not more than 20% by weight and not less than 30% by weight inorganic filler.

Triethylene glycol diacetate ('TEGDA'), glycerol triacetate ('triacetin') or glycerol diacetate ('diacetin'), for example, can be used as the non-polyol aerosol generator either individually or in combination. As is well known to those skilled in smoking article science and technology, TEGDA and triacetin are substances with an established use as plasticisers (bonding agents) for cellulose acetate cigarette-filter tow. It was thus surprising to find that these substances and similar substances, when used as aerosol generating substances in smoking materials according to the subject invention, provide aerosols in mainstream smoke which smokers register as very acceptable.

Non-polyol aerosol generator is usefully present in smoking materials of the subject invention at levels in a range of about 2% to about 30% by weight. More usually the range will be about 5% to about 20% by weight, and more usually 5-15%.

Total aerosol generator can include a polyol aerosol generator, such as for example one or more of glycerol, propylene glycol and triethylene glycol.

Smoking materials according to the subject invention can, as will be readily appreciated by those skilled in the art, be fabricated by slurring the components, in fine particulate form, with water and casting the slurry to sheet form on a band or wire sheet-forming machine or on a heated drum. An alternative is to feed a mixture of the components, together with water, to an extruder. The product of casting or extrusion is suitably cut and shredded to provide smoking material of particulate form.

If the components used to provide the smoking material do not include tobacco, then advantageously the smoking material, in particulate form, is blended with particulate tobacco. In such case, the smoking material expediently accounts for at least about 30% by weight of the blend. Suitably, the smoking material will account for the majority, by weight, of the blend, that is more than 50% by weight of the blend. The tobacco in the blend may be expanded tobacco.

A class of substance suitable for the selection therefrom of binder in smoking materials according to the subject invention is the alginates. Sodium alginate has been found to

be advantageous. Other suitable binder substances are celluloses or modified celluloses, hydroxypropyl cellulose or carboxymethyl cellulose, for example, starches or modified starches and natural gums.

Suitable substances for use as inorganic filler are calcium carbonate, perlite, vermiculite, diatomaceous earth, colloidal silica, magnesium oxide, magnesium sulphate, magnesium carbonate or other low density inorganic filler materials known to those skilled in the art.

In smoking materials according to the subject invention inorganic filler is preferably present at a level of at least about 35%, preferably at least about 40% and more preferably at least about 45% by weight.

In smoking materials according to the subject invention tobacco may be present at less than 15%, preferably less than 10% and more preferably less than 5%. The binder of smoking materials according to the invention may be present at less than 15%, and more preferably less than 10% by weight.

Smoking materials according to the subject invention may comprise one or more mechanical stabiliser or strengthening materials, examples being cocoa, sugar and fibre, paper fibre for instance. Expansion medium, such as starch, pullulan or other polysaccharides or foaming agents, for example, and high fat or high oil materials, such as cocoa butter or olive oil, corn oil, for example, may also be advantageously included.

Smoking material according to the invention may be used in a conventional smoking article, either blended with another

smoking material, which may be tobacco material, or not or in a coaxial arrangement, for example.

According to a second aspect of the subject invention a smoking article comprising a smokable rod and a filter, said rod comprising a core and an outer part, said core comprising a first particulate smoking material and a first cigarette paper wrapper enwrapping said first smoking material and said outer part comprising a second particulate smoking material disposed annularly about said core and a second cigarette paper wrapper enwrapping said second smoking material, wherein either of said first or said second smoking material comprises a non-polyol aerosol generator, up to 20% by weight tobacco, binder at not more than 20% by weight and not less than 30% by weight inorganic filler.

As will be observed, one of the said smoking materials of the smoking article of the second aspect of the subject invention is as per the smoking material of the first above recited aspect of the subject invention. The smoking material of the first above recited aspect of the subject invention may be present in both the first smoking material and the second smoking material of the smoking article above.

Preferably the said second smoking material of the smoking article is as per the smoking material of the first above recited aspect of the subject invention.

Expediently, the first smoking material is cut tobacco filler, suitably cut lamina filler.

Much by preference, in smoking articles in accordance with the subject invention both the core and the outer part of the

smokable rod extend over the full length of the rod. It is much by preference too for the core to be disposed coaxially of the rod.

In a third aspect of the invention, there is provided a smoking article comprising a smokable rod and a filter, the smokable rod comprising smoking material and the filter comprising filtration material provided with an elutable aerosol generator which is a polyol and/or a non-polyol aerosol generator, the aerosol generator being elutable from the filter upon smoking of the smoking article to enhance the aerosol provided from the smoking material.

The smoking article may be of a coaxial arrangement or non-coaxial arrangement.

Advantageously the smoking material comprises an aerosol generator, a binder and an inorganic filler, and is more advantageously comprised of a non-polyol aerosol generator, up to 20% by weight tobacco, binder at not more than 20% by weight and not less than 30% by weight inorganic filler. Alternatively the smoking material may comprise one or more of the aerosol generating means or aerosol generating fuel sources of our co-pending application filed on 6 September 1995 under International Patent Application No. PCT/GB 95/02110. As a further alternative, the smoking material may comprise conventional cut tobacco leaf material.

The aerosol generator may be a polyhydric alcohol, an ester, a high boiling point hydrocarbon, glycerol, propylene glycol, triethylene glycol, methylene glycol, methyl citrate, triacetin or diacetin, either alone or in combination.

In a smoking article of an exterior circumference conventional for a cigarette, i.e. c.25mm, the exterior circumference of the said core is suitably about 17mm.

EXAMPLE 1

A smoking article, a cigarette, exemplary of the subject invention comprised a core of approximately 17mm circumference, which core consisted of cut lamina filler conventional for ultra-slim cigarettes, such, for example, as the ultra-slim cigarette made by British American Tobacco (Germany) under the brand name CAPRICE, and a wrapper of conventional cigarette paper. The outer part of the cigarette disposed annularly about the core consisted of a blend of 50% by weight of expanded lamina tobacco and 50% by weight of a smoking material according to the subject invention enwrapped in an outer wrapper of low sidestream cigarette paper made by Glatz Inc. under the experimental designation GNS40MV. The expanded tobacco had been expanded by the well known Dry Ice Expanded Tobacco (DIET) tobacco expansion process. The smoking material according to the subject invention, which had been band cast and then cut and shredded, had a percentage composition by weight as follows.

TEGDA	2.6
Glycerol	6.5
Conventional Tobacco Blend (ground)	19.8
Sodium Alginate	9.9
Chalk	48.3
Cocoa	6.4

Demerera Sugar	3.0
Paper Fibre	3.5

The core and the outer part were lengthwise coterminous.

The cigarette according to the subject invention further comprised a conventional ventilated fibrous cellulose acetate filter.

EXAMPLE 2

A second exemplary smoking material in accordance with the subject invention is of a percentage composition by weight as follows.

TEGDA	6
Glycerol	6
Conventional Tobacco Blend (ground)	20
Sodium Alginate	10
Chalk	51
Cocoa	4
Demerera Sugar	3

This second smoking material in cut and shredded form could, for example, be blended with a conventional cut tobacco cigarette filler. The ratio in the blend of smoking material to filler might, for instance, be 7:3. The blend could be fed to a cigarette making machine to provide cigarette rod comprising the blend and a wrapper of conventional cigarette paper or a low sidestream paper, for example.

EXAMPLE 3

A third exemplary smoking material in accordance with the subject invention is of a percentage composition by weight as follows.

TEGDA	10
Glycerol	4
Sodium Alginate	8
Chalk	78

This third smoking material in cut and shredded form could, for example, be blended with conventional cut tobacco filler in a ratio of, for instance, 4:6 and used for the provision of cigarette rod.

EXAMPLE 4

The following three smoking material formulations were prepared for comparison. The compositions are percentage by weight of each component.

TABLE 1

	Sample Number		
	1	2	3
Triacetin	0	9.6	4
Glycerol	8.6	0	4
Conventional Tobacco Blend (ground)	20.3	20.1	20
Sodium Alginate	8.1	8	8
Fibre	1	1	1
Perlite	62	61.3	63

Smoke Deliveries

Puff No.	3.4	5.3	4.0
TPM (mg/cig)	7.5	5.3	7.6
Water (mg/cig)	2.7	0.8	2.1
Nicotine (mg/cig)	0.19	0.1	0.2
Glycerol (mg/cig)	1.11	n/m	n/m
Triacetin	n/m	2.03	n/m
NFDPM (mg/cig)	4.59	4.36	5.35
NAFDPM (mg/cig)	3.48	2.33	n/m

NAFDM = Nicotine, aerosol free dry particulate matter
(aerosol being glycerol or triacetin).

NFDPM = Nicotine free dry particulate matter.

n/m = Not measured

The cigarettes were smoked under standard machine smoking conditions of 35cm³ puff of 2 seconds duration taken every minute to a butt length of 35mm.

EXAMPLE 5

In order to observe the influence of an aerosol generator held on a filter element against a smoking article having a standard fibrous cellulose acetate filter the mixed glycerol and triacetin sheet (Sample 3 of Example 4 above) was used in smoking articles with an aerosol generator in the filter at various levels. The cigarettes were of 84mm length, c.8mm diameter with a 27mm filter element and were smoked under standard machine smoking conditions to 35mm butt length. The aerosol generator on the filter was propylene glycol (PG).

TABLE 2

	Sample Number				
	4	5	6	7	8
PG on filter (mg)	0	5	10	20	30
<u>Smoke Deliveries</u>					
Puff Number	4	4	4	3.75	4
TPM (mg/cig)	7.6	5.7	7.56	8.4	11.6
Water (mg/cig)	2.05	1.35	1.33	1.58	2.23
Nicotine (mg/cig)	0.20	0.17	0.17	0.13	0.15
NFDPM (mg/cig)	5.35	4.18	6.06	6.69	9.22
<u>% Smoke Composition</u>					
Water (%)	27.0	23.7	17.6	18.8	19.2
Nicotine(%)	2.6	3.0	2.2	1.5	1.3

It can be seen that the presence of additional aerosol generator dilutes the smoke constituents and provides a useful means for reducing the smoke delivery levels of various smoke components.

EXAMPLE 6

Other formulations of smoking material according to the invention were made according to Table 3. Additional materials included starch, oils and alkaline water. In Sample 58a a 0.1M solution of sodium carbonate was made up and added to the dry mixture instead of the usual water, until the required pH was reached. The compositions are percentage by weight of each component.

TABLE 3

Sample No.	Tobacco	Sodium Alginate	Sugar	Cocoa	Chalk	Glycerol	Tegda	Triacetin	Other Components
2a	20	10	15	4	39	6	6		
3a	20	10	3	20	35	6	6		
5a	20	10	3	4	37	6	20		
7a	20	10	3	4	51	6	-	6	
8a	20	10	3	4	37	6	-	20	
10a	20	10	3	4	51	-	12	-	
11a	18	9	3	4	56	-	10	-	
12a	20	10	3	4	41	6	6	-	10 (Paper Fibre)
16a	20	10	3	-	45	6	6	-	10 (Starch)
17a	20	10	3	-	45	6	6	-	10 (Cocoa Butter)
26a	20	25	3	4	36	6	6	-	
34a	20	10	3	-	45	6	6	-	10 (Corn oil)
39a	20	10	-	-	55	-	-	15	
41a	20	10	3	4	-	6	6	-	51 (Perlite)
42a	20	10	3	4	26	6	6	-	25 (Perlite)
51a	20	10	3	-	30	6	6	-	15 (Cooked Starch)
52a	20	10	-	-	55	-	-	-	15 (Olive oil)
58a	20	10	3	4	51	6	6	-	pH=9.3

CLAIMS

1. A smoking material comprising a non-polyol aerosol generator, up to 20% by weight tobacco, binder at not more than 20% by weight and not less than 30% by weight inorganic filler.
2. A smoking material according to Claim 1, wherein said non-polyol aerosol generator is one or more of triethylene glycol diacetate, glycerol triacetate and glycerol diacetate.
3. A smoking article according to Claim 1 or 2, wherein said non-polyol aerosol generator is present in said smoking material in a range of about 2% to about 30% by weight.
4. A smoking material according to Claim 3, wherein said non-polyol aerosol generator is present in a range of about 5% to about 20% by weight.
5. A smoking material according to Claim 4, wherein said non-polyol aerosol generator is present in a range of about 5% to about 15% by weight.
6. A smoking material according to any one of Claims 1 to 5, wherein said inorganic filler is present in said smoking material at a level of at least 35% by weight.
7. A smoking material according to Claim 6, wherein said inorganic filler is present at a level of at least 40% by weight.
8. A smoking material according to Claim 7, wherein said inorganic filler is present at a level of at least 45% by weight.

9. A smoking material according to any one of the preceding claims, wherein said tobacco in said smoking material is present at less than 15% by weight.
10. A smoking material according to Claim 9, wherein said tobacco is present at less than 10% by weight.
11. A smoking material according to Claim 10, wherein said tobacco is present at less than 5% by weight.
12. A smoking material according to any one of the preceding claims, wherein said binder in said smoking material is present at less than 15% by weight.
13. A smoking material according to Claim 12, wherein said binder is present at less than 10% by weight.
14. A smoking material according to any one of the preceding claims, wherein said inorganic filler is one or more of calcium carbonate, perlite, vermiculite, diatomaceous earth, colloidal silica, magnesium oxide, magnesium sulphate, magnesium carbonate or other low density inorganic filler materials.
15. A smoking article according to any one of the preceding claims, wherein said binder is one or more of an alginate, celluloses or modified celluloses, starches or modified starches, and natural gums.
16. A smoking material according to any one of the preceding claims, wherein said smoking material further comprises a mechanical stabiliser or strengthening material, an expansion medium or a high fat or high oil containing material.

17. A smoking material according to Claim 16, wherein said material further comprises one or more of cocoa, sugar, fibre, starch, pullulan, other polysaccharide expansion agents, foaming agents, cocoa butter, olive oil and corn oil.
18. A smoking article comprising a smokable rod and a filter, said rod comprising a core and an outer part, said core comprising a first particulate smoking material and a first cigarette paper wrapper enwrapping said first smoking material and said outer part comprising a second particulate smoking material disposed annularly about said core and a second cigarette paper wrapper enwrapping said second smoking material, wherein either of said first or said second smoking material comprises a non-polyol aerosol generator, up to 20% by weight tobacco, binder at not more than 20% by weight and not less than 30% by weight inorganic filler.
19. A smoking article according to Claim 18, wherein said smoking material of either of said first or second smoking material comprises a smoking material in accordance with any one of Claims 2 to 17.
20. A smoking article according to Claim 18 or 19, wherein said second smoking material is said smoking material according to any one of Claims 1 to 17.
21. A smoking article according to Claim 18 or 19, wherein both said first and said second smoking materials comprises a proportion of a smoking material comprising a non-polyol aerosol generator, up to 20% by weight tobacco,

binder at not more than 20% by weight and not less than 30% by weight inorganic filler.

22. A smoking article according to any one of Claims 18-21, wherein the other of said first or second smoking material is cut tobacco filler.
23. A smoking article according to any one of Claims 18-22, wherein both said core and said outer part of said smokable rod extend over the full length of said rod.
24. A smoking article according to any one of Claims 18-23, wherein said core is disposed coaxially of said rod.
25. A smoking article comprising a smokable rod and a filter, the smokable rod comprising smoking material and the filter comprising filtration material provided with an elutable aerosol generator which is a polyol and/or a non-polyol aerosol generator, the aerosol generator being elutable from the filter upon smoking of the smoking article to enhance the aerosol provided from the smoking material.
26. A smoking article according to Claim 25, wherein said rod comprises an axially arranged core disposed within an annulus.
27. A smoking article according to Claims 25 or 26, wherein said smoking material comprises an aerosol generator, a binder and an inorganic filler.
28. A smoking article according to Claim 27, wherein said smoking material is the smoking material described in any one of Claims 1 to 17.

29. A smoking material substantially as hereinabove described with reference to any one of Examples 1 to 6 hereof.
30. A smoking article substantially as hereinabove described with reference to any one of Examples 1 to 6 hereof.

INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 98/01586

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 A24B15/16 A24D3/14

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 A24B A24D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	LU 66 008 A (IMPERIAL CHEMICAL INDUSTRIES LIMITED) 17 January 1973	1-6, 9-12, 14-16
Y	see example 4	18-20, 22-24, 27
Y	--- US 4 917 121 A (RIEHL ET AL.) 17 April 1990 see column 2, line 22 - line 55; figure 2	18-20, 22-24, 27
X	see column 3, line 8 - line 24	25-28
A	--- US 4 924 886 A (LITZINGER) 15 May 1990 see column 2, line 30 - column 3, line 8; figure 1 --- -/--	18-20, 22-24

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"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

9 November 1998

Date of mailing of the international search report

18. 11. 1998

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INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 98/01586

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,X	WO 97 32490 A (BRITISH AMERICAN TOBACCO) 12 September 1997 see page 9, paragraph 1; claims; tables 1,3,5 ---	1-17
X	US 5 056 537 A (BROWN ET AL.) 15 October 1991 see column 3, line 48 - column 4, line 21; claims 13-16 ---	25
X	GB 755 479 A (PHILIP MORRIS) 22 August 1956 see page 1, line 64 - line 80; examples -----	25

INTERNATIONAL SEARCH REPORT

International application No.
PCT/GB 98/01586

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☒ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☒ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-24

A smoking material comprising a non-polyol aerosol generator, up to 20% by weight tobacco, binder at not more than 20% by weight and not less than 30% by weight inorganic filler.

2. Claims: 25-30

A smoking article comprising a smokable rod and a filter, the smokable rod comprising smoking material and the filter comprising filtration material provided with an elutable aerosol generator, the aerosol generator being elutable from the filter upon smoking of the smoking article.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 98/01586

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